



Ambient Groundwater Quality Monitoring Implementation Plan For Fiscal Year 2015

Purpose

This document outlines how the Groundwater Characterization Program (GWCP) resources will be allocated to implement the Ambient Groundwater Quality Monitoring Strategy in Fiscal Year 2015 (FY15).

Cost Analysis

A total of \$72,678 has been allotted to statewide groundwater sampling activities in FY15. The monies will be used for laboratory analytical costs, fuel costs and staff per diem for the collection of 40 samples. Table 1 shows the proposed cost breakdown for the number of spot wells and trend wells in coastal plain and fractured rock provinces that will be sampled.

The U.S. Geological Survey (USGS) will receive \$47,240 to continue monitoring of up to fourteen (14) chloride samples and one (1) equipment blank sample for QA/QC purposes in Virginia's Coastal Plain region.

Approximately \$67,000 will be directed toward the purchase and modification of one (1) four-wheel drive (4x4) box truck capable of carrying sampling pumps, reels and other bulky sampling equipment including generators, coolers, and the large volumes of ultrapure water necessary to run field blanks on submersible sampling pumps. In addition to providing secure storage for these items, the sample truck will have a sample processing area for sample collection and preparation in a controlled environment. The anticipated purchase of the truck in FY14 did not occur due to budget constraints.

Table 1: Proposed distribution of laboratory analytical and logistical budget for FY15.

	Cost per Unit	Fractured Rock		Coastal Plain			Total Costs
		Trend Wells	Spot Sampling	Trend Wells	Spot Sampling	Total #	
Number of Monitoring Sites	N/A		16	4	8	28	N/A
Ground 3 (Major Ions, Nutrients, Physical parameters)	\$235.00		16	16	8	40	\$9,400.00
Anthropogenics (VOCW & PIDW)	\$629.00		16	8	8	32	\$20,128.00
Equipment Blank - Ground 3	\$235.00		2			2	\$470.00
Trace Metals (DCMETU)	\$260.00		16	16	8	40	\$10,400.00
Field Blank - Trace Metals (1 dissolved per well)	\$208.00		16	16	8	40	\$8,320.00
Radiologicals (ARGBS)	\$270.00		16	4	8	28	\$7,560.00
Age-Dating Pilot Study; Helium/Tritium (Columbia Univ)	\$1,000.00		2				\$2,000.00
Age-Dating Pilot Study; CFC, N/Ar, SF-8 (USGS)	\$1,000.00		2				\$2,000.00
Acid Wash Tubing and Carboys	\$1,000.00					2	\$2,000.00
Total Laboratory Expenditure							\$62,278.00
Fuel (Est. 300 mile roundtrip)*	\$80.00		16	16	8	40	\$3,200.00
Lodging (1 night per 2 wells sampled)**	\$90.00		16	16	8	40	\$3,600.00
Per Diem (per person)**	\$45.00		32	32	16	80	\$3,600.00
Total Estimated Travel Costs							\$10,400.00
Total Estimated DEQ Sample Costs							\$72,678.00
* 2 vehicles for trend and spot sampling; ** 2 staff minimum for trend and spot sampling							
*** Does not include money budgeted to USGS for Chloride Monitoring ***** All laboratory costs assume Standard Turn-Around Times							

Trend Sampling Sites

Coastal Plain

For FY 2015, Virginia Department of Environmental Quality staff will obtain quarterly samples from the Tier 1 (existing chloride monitoring network well) Diascund Research Station Well SOW 177A (USGS 56H 25), the existing chloride monitoring network well Dominion Terminal Associates Well SOW 213 (USGS 59D 25), the existing chloride monitoring network well Greenmont Production Well SOW 195 (USGS 58F 127), and Flume Observation well DEQ 147-308 (USGS 57F 36).

Fractured Rock Provinces

Trend well monitoring will not occur in the fractured rock provinces during FY 2015.

Spot Sampling Areas

A total of 24 spot samples will be collected in FY 2015 by the Department of Environmental Quality staff throughout the Commonwealth of Virginia. The Appalachian Plateaus, Valley and Ridge, Blue Ridge, and Piedmont Provinces are collectively termed the “Fractured Rock” Provinces. A total of 16 spot samples will be collected in areas of the Fractured Rock Provinces identified as having low to non-existent groundwater quality data and represented by white to light green colors on the map in Figure 1. An additional 8 spot samples will be collected in the Coastal Plain. Wells will be selected on the following criteria: 1) proximity to critical points identified in the ongoing USGS Salt-water intrusion study and/or 2) areas identified, for specific aquifers, having low to non-existent groundwater quality data and represented by white to light green colors on the maps in Figures 2-6.

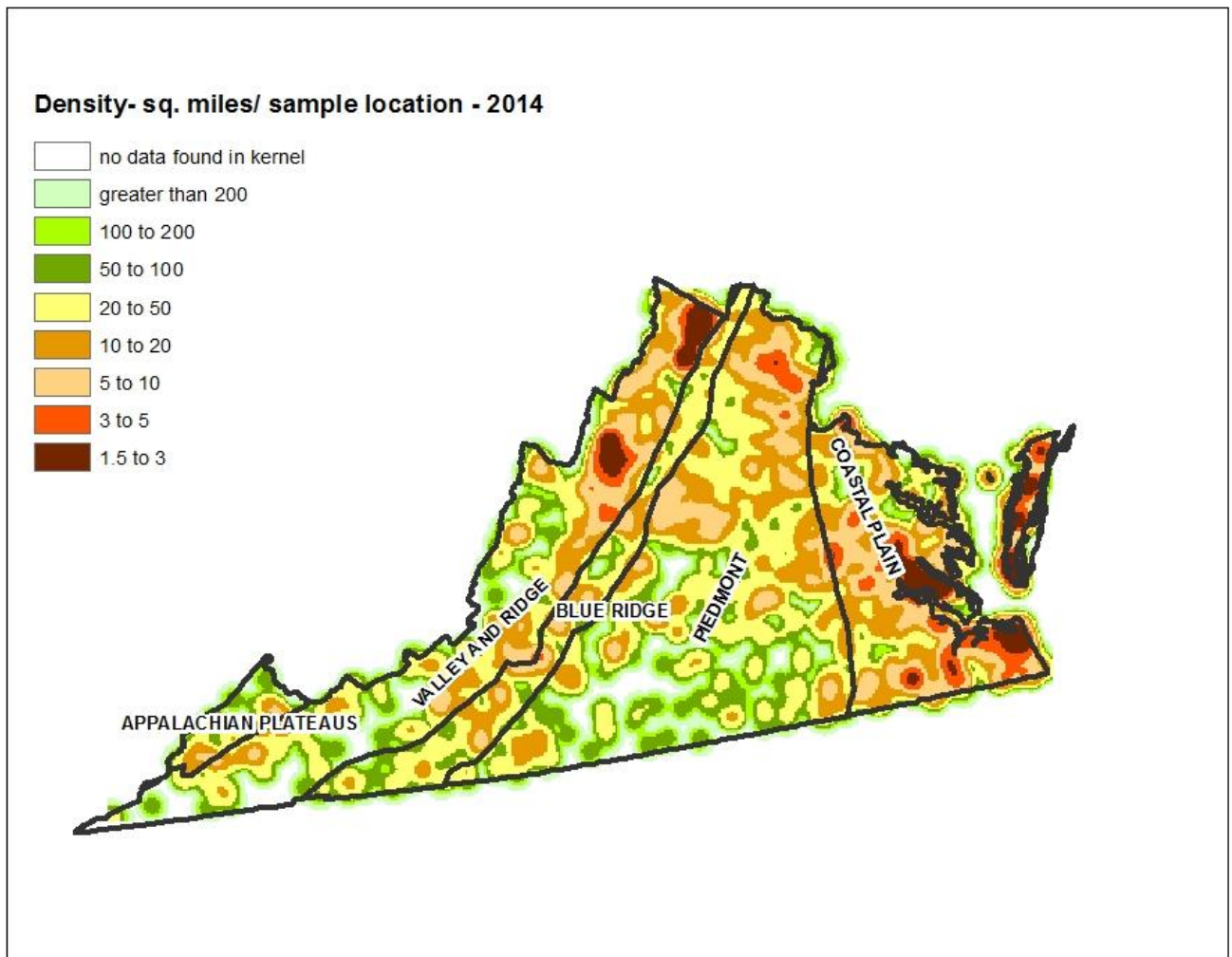


Figure 1: Density distribution of current groundwater sample coverage.

Nearly 100 percent of ground water in the Coastal Plain is derived from five aquifers. In order of importance these are the Potomac (75%), Yorktown-Eastover (13%), Piney Point (5%), Surficial (5%), and Aquia (3%) (McFarland and Bruce, 2006, Table 3). Each aquifer has distinct physical and chemical characteristics.

Hydrogeologic Unit	Percent of Ground Water Withdrawal
surficial aquifer	4-5
Yorktown-Eastover aquifer	13
Piney Point aquifer	5
Aquia aquifer	3
Potomac aquifer	75

Table 2. Principle Coastal Plain Aquifers and Percent of Ground Water Withdrawal. Listed in stratigraphic order from surface to greatest depth (Potomac aquifer).

Eight spot samples will be collected in the Coastal Plain from specific aquifers. The USGS Water Science Center is developing a chloride monitoring network which identifies future observation well locations based on the proximity of production wells to the 250 mg/l isochlor. Priority areas will be defined and well locations will be identified for specific aquifer sampling based on the USGS study. In addition to these priority areas, additional wells will be sampled in the Coastal Plain in areas of low to non-existent groundwater quality data for specific aquifers as recognized in figures 2-6.

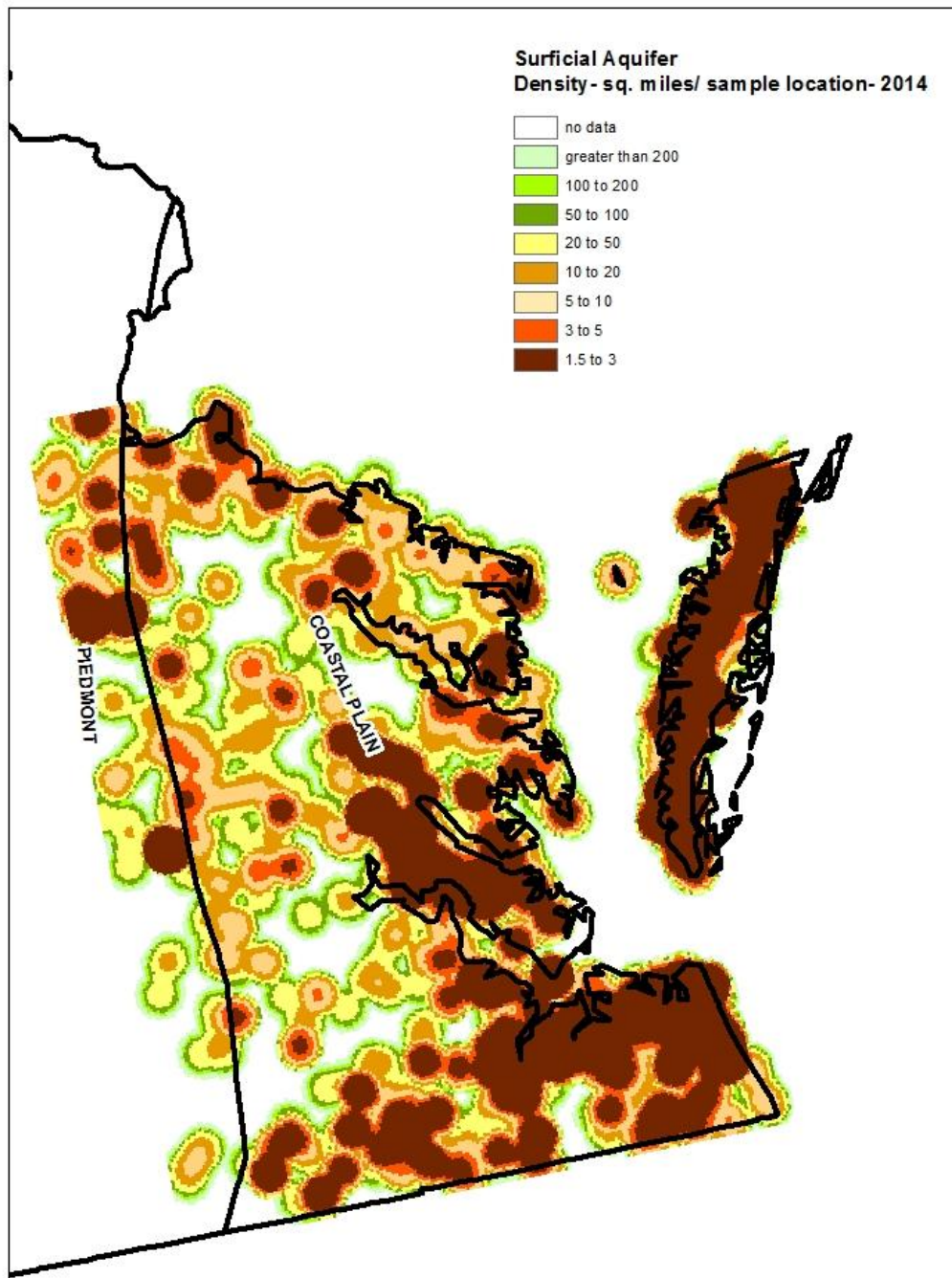


Figure 2: Density distribution of surficial aquifer current groundwater sample coverage (data from McFarland 2010).

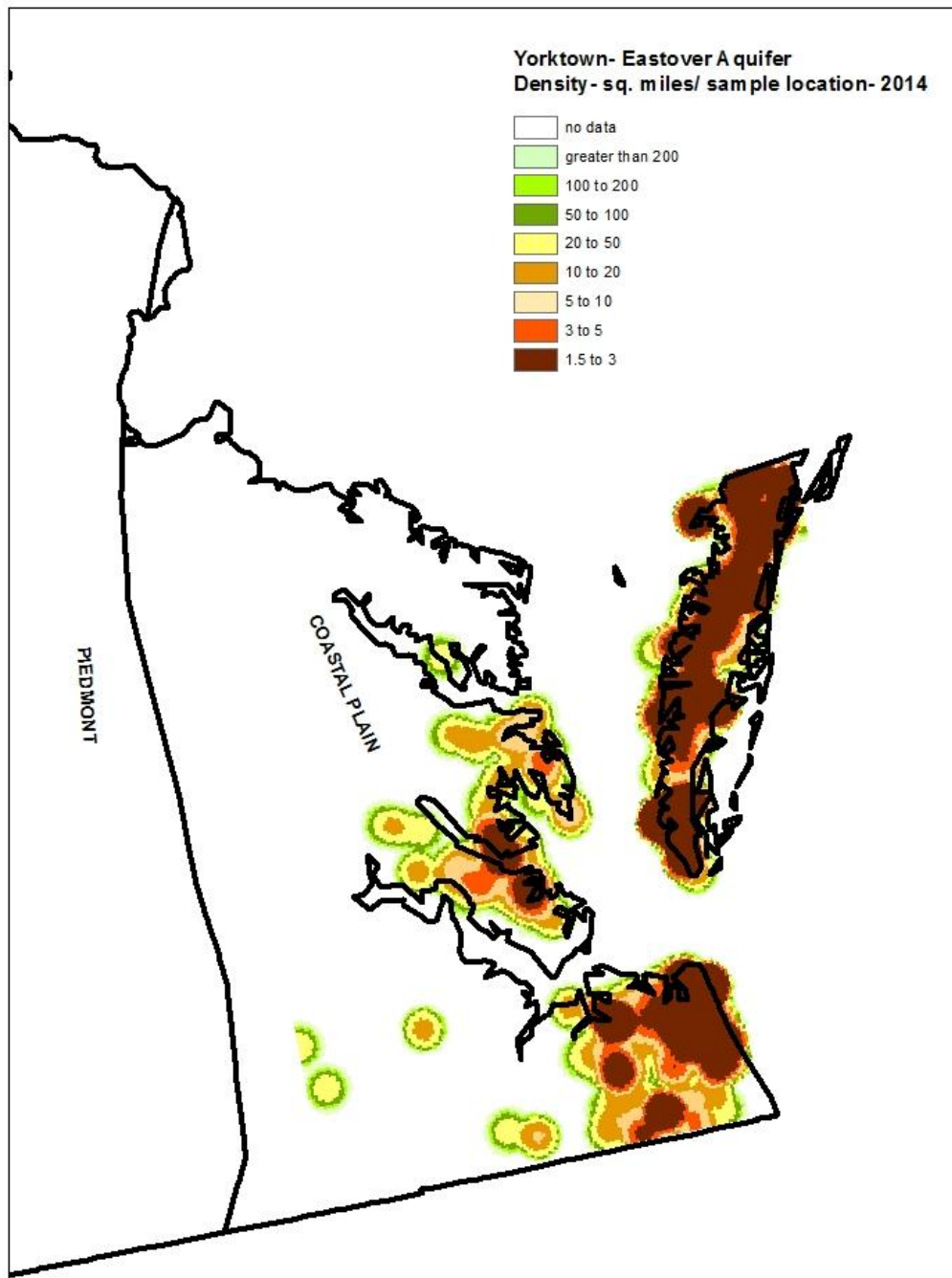


Figure 3: Density distribution of Yorktown-Eastover Aquifer current groundwater sample coverage (data from McFarland 2010).

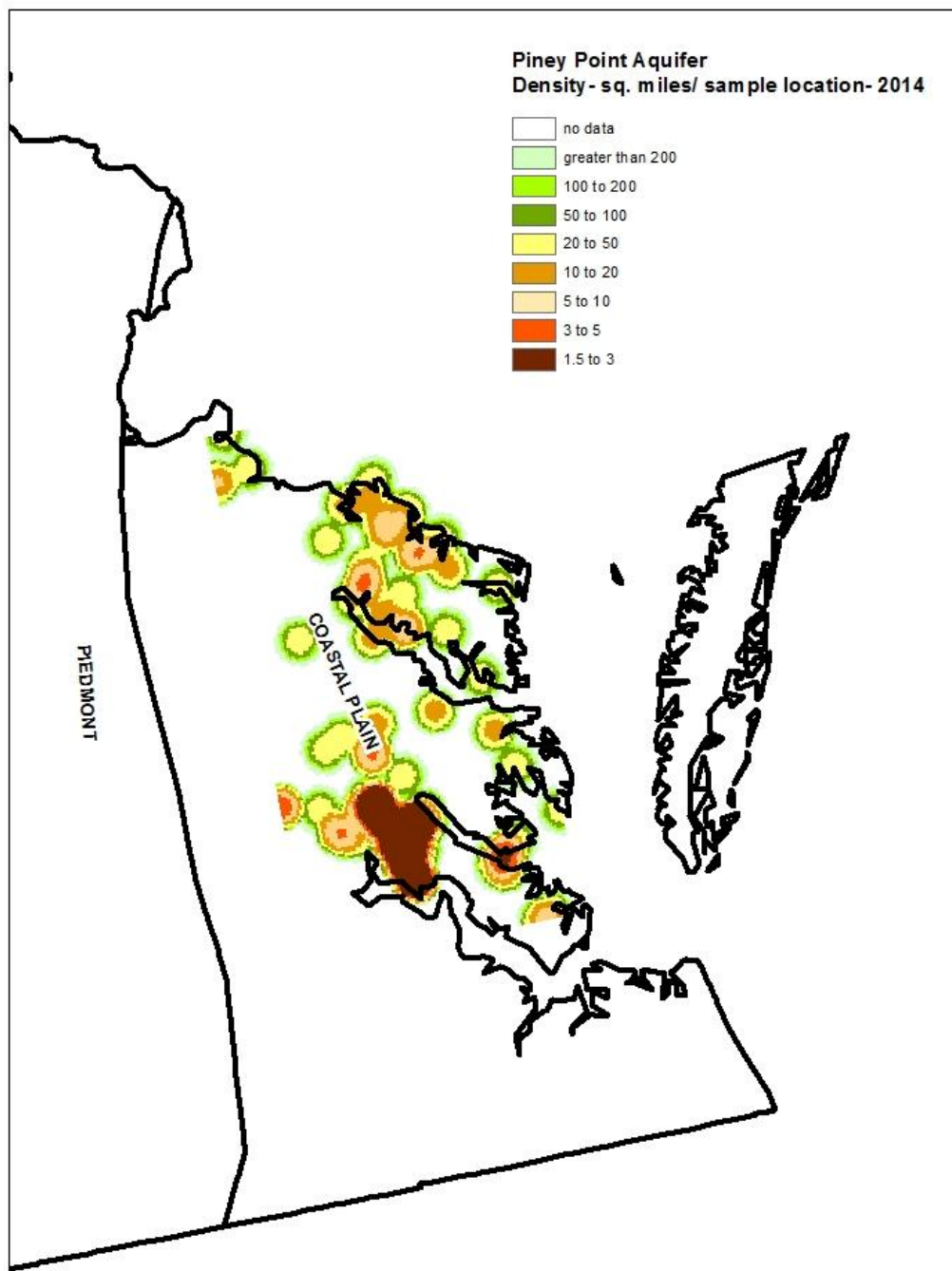


Figure 4: Density distribution of Piney Point Aquifer current groundwater sample coverage (data from McFarland 2010).

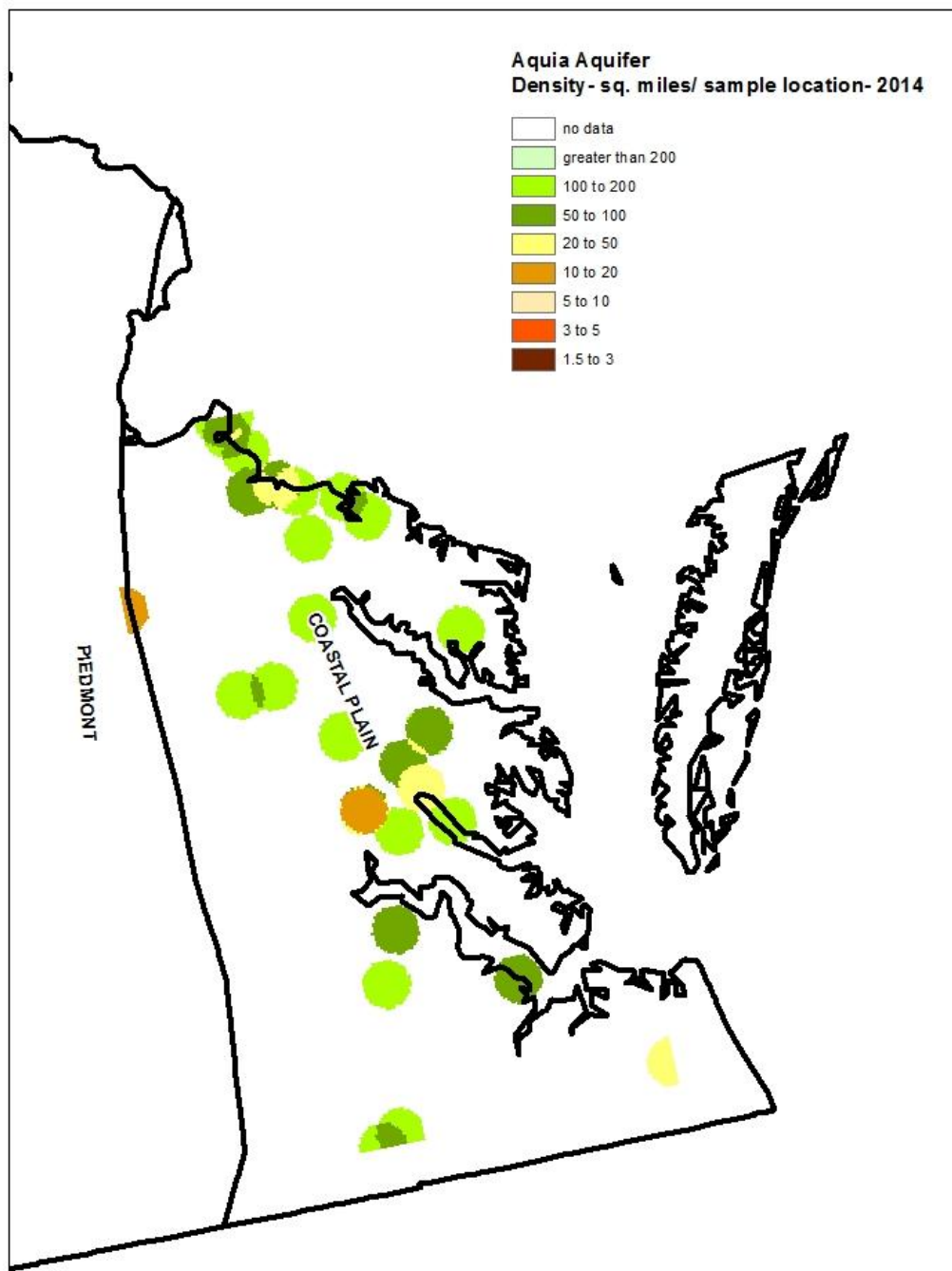


Figure 5: Density distribution of Aquia Aquifer current groundwater sample coverage (data from McFarland 2010).

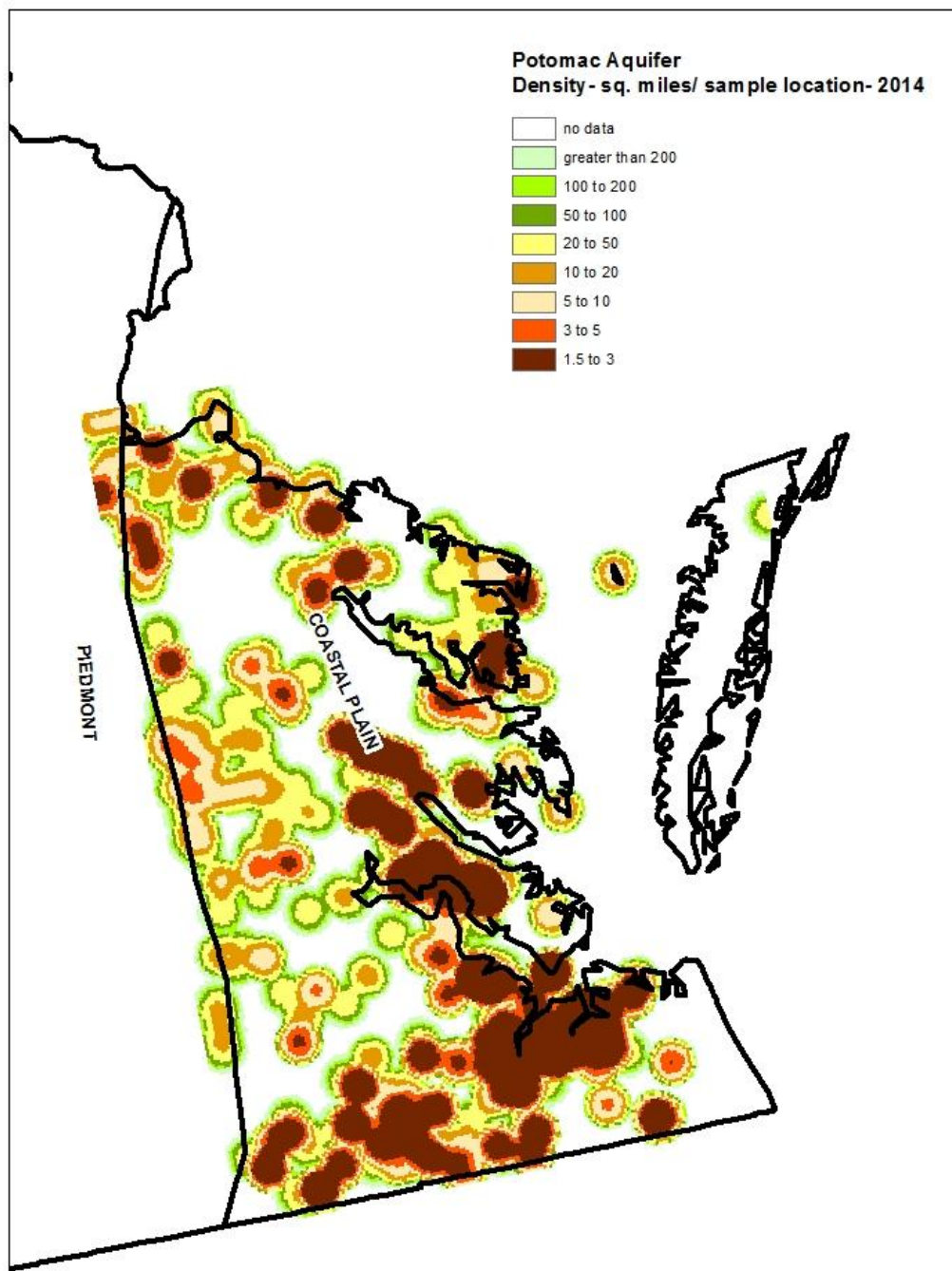


Figure 6: Density distribution of Potomac Aquifer current groundwater sample coverage (data from McFarland 2010).

For FY 2015, USGS Virginia Water Science Center staff will collect 12 to 14 spot samples in the Coastal Plain. These will include Sussex Wells 239-A,B,C,D; Swannanoa Wells 236-A,B,C; McKendree Church Wells (SOW 235A,B,C,D); Ambrose Well 230; and Flume Observation well (DEQ 147-308).

Fiscal Year 2015 Sampling Calendar:

Below is the calendar for FY15 that includes sampling run dates. Spot areas are within the geologic province where sampling will occur. Shaded blocks indicate known dates when sampling will not be possible due to schedule conflicts. Sampling is restricted to Monday-Thursday because samples cannot be submitted to the laboratory on Fridays. USGS sampling events are not included in the calendar.

SPOT AP/VR=Appalachian Plateau/Valley & Ridge		SPOT BR/PD=Blue Ridge/Piedmont		SPOT CP= Coastal Plain		TREND CP= Coastal Plain	
MONTH	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
June 2014	29	30	1	2	3	4 Independence Day	5
July 2014	6	7 SPOT- CP Swannanoa	8 SPOT- CP Swannanoa	9	10	11	12
	13	14	15 SPOT-BR/PD	16 SPOT- BR/PD	17 SPOT- BR/PD	18	19
	20	21	22 SPOT-BR/PD	23 SPOT- BR/PD	24 SPOT- BR/PD	25	26
	27	28	29	30	31	1	2
August 2014	3	4 Newport News Rotosonic	5 Newport News Rotosonic	6 Newport News Rotosonic	7 Newport News Rotosonic	8 Newport News Rotosonic	9
	10	11 Newport News Rotosonic	12 Newport News Rotosonic	13 Newport News Rotosonic	14 Newport News Rotosonic	15 Newport News Rotosonic	16
	17	18 Newport News Rotosonic	19 Newport News Rotosonic	20 Newport News Rotosonic	21 Newport News Rotosonic	22 Newport News Rotosonic	23
	24	25	26	27	28	29	30
	31	1 Labor Day	2	3	4	5	6

September 2014	7	8	9 TREND- CP Dominion	10 TREND- CP Greenmont	11 TREND- CP	12	13
	14	15	16 TREND- CP Flume Well	17 TREND- CP Diascund	18 TREND- CP	19 VWWA FALL MEETING	20
	21	22	23 Fall Begins	24	25	26	27
	28	29	30 SPOT-AP/VR	1 SPOT- AP/VR	2 SPOT- AP/VR	3	4
October 2014	5	6	7 SPOT-AP/VR	8 SPOT- AP/VR	9 SPOT- AP/VR	10	11
	12	13 Columbus Day	14	15	16	17	18
	19	20	21 SPOT- CP Sussex A	22 SPOT- CP Sussex B	23 SPOT- CP	24	25
	26	27	28 SPOT- CP Sussex C	29 SPOT- CP Sussex D	30 SPOT- CP	31 Halloween	1
November 2014	2 Daylight Saving Time Ends	3	4 TREND- CP Dominion	5 TREND- CP Greenmont	6 TREND- CP	7	8
	9	10	11 Veterans' Day	12	13	14	15
	16	17	18 TREND- CP Flume Well	19 TREND- CP Diascund	20 TREND- CP	21	22
	23	24	25	26	27 Thanksgiving Day	28	29
	30	1	2	3	4	5	6
December 2014	7	8	9	10	11	12	13
	14	15	16	17	18	19	20
	21	22	23	24	25 Christmas	26	27
	28	29	30	31	1 New Year's Day	2	3

January 2015	4	5	6	7	8	9	10
	11	12	13	14	15	16 Lee-Jackson Day	17
	18	19 Martin Luther King	20	21	22	23	24
	25	26	27	28	29	30	31
February 2015	1	2 Groundhog Day	3 SPOT- CP	4 SPOT- CP	5 SPOT- CP	6	7
	8	9	10	11	12	13	14 Valentine's Day
	15	16 Presidents' Day	17	18	19	20	21
	22	23	24 TREND- CP	25 TREND- CP	26 TREND- CP	27	28
March 2015	1	2	3 TREND- CP	4 TREND- CP	5 TREND- CP	6	7
	8 Daylight Saving Time Begins	9	10	11	12	13	14
	15	16 Banbury Aquifer Test	17 Banbury Aquifer Test	18 Banbury Aquifer Test	19 Banbury Aquifer Test	20 Spring Begins	21
	22	23	24	25	26	27	28
	29	30	31	1	2	3 Good Friday	4
April 2015	5 Easter	6	7	8	9	10	11
	12	13	14	15	16	17	18
	19	20	21	22 Earth Day	23	24 Arbor Day	25

	26	27	28 SPOT-BR/PD	29 SPOT-BR/PD	30 SPOT-BR/PD	1	2
May 2015	3	4	5 TREND- CP	6 TREND- CP	7 TREND- CP	8	9
	10 Mother's Day	11	12 TREND- CP	13 TREND- CP	14 TREND- CP	15	16
	17	18 Rotosonic	19 Rotosonic	20 Rotosonic	21 Rotosonic	22 Rotosonic	23
	24	25 Memorial Day	26	27	28	29	30
	31	1	2 SPOT-AP/VR	3 SPOT-AP/VR	4 SPOT-AP/VR	5	6
June 2015	7	8	9 SPOT-AP/VR	10 SPOT-AP/VR	11 SPOT-AP/VR	12	13
	14 Flag Day	15	16 SPOT-BR/PD	17 SPOT-BR/PD	18 SPOT-BR/PD	19	20
	21 Father's Day	22	23	24	25	26	27
	28	29	30	1	2	3	4 Independence Day

Figure 7. Sampling schedule for FY 2015. The number of samples to be taken for each area are as follows: SPOT-AP/VR- 8; SPOT-BR/PD- 8; SPOT-CP- 8; TREND-CP- 16.

Reference

McFarland, E.R., 2010, Groundwater-quality data and regional trends in the Virginia Coastal Plain, 1906-2007: U.S. Geological Survey Professional Paper 1772, 86p., 14pls.